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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

PPC0116 – PRE-CALCULUS
(All Sections / Groups)

12 OCTOBER 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **3 printed pages** (including the cover page) with **4 questions only**.
2. Each question is worth **25 marks**. Attempt **ALL** questions.
3. Please write all your answers in the Answer Booklet provided. Show **all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

- (a) Solve the following equations and inequality:

(i) $\sqrt{b-1} + \sqrt{b+2} = \sqrt{3}$. [5 marks]

(ii) $\frac{1}{2x-1} = \frac{3}{x-3} + \frac{5}{x+1}$. [5 marks]

(iii) $2|3-2x| \geq 20$. [3 marks]

(iv) $\frac{2t+3}{3-t} \leq \frac{t-1}{t+4}$ [7 marks]

- (b) Find the exact value of
- $\sqrt{21+2\sqrt{2}+\frac{4}{2+\sqrt{2}}}$
- without the use of calculator.

[5 marks]

Question 2 (25 marks)

- (a) For the polynomial
- $f(x) = (x+2)^2(x-3)(x-5)$
- ,

(i) determine the end behaviour of the graph of $f(x)$. [1 mark](ii) find the x - and y - intercept(s), if any. [4 marks](iii) state whether the graph crosses or touches the x axis at the x -intercept. [2 marks]

(iv) determine the maximum number of turning points. [2 marks]

(v) sketch the graph of $f(x)$. [4 marks]

- (b) A function
- $f(x)$
- is defined as:

$$f(x) = \begin{cases} x+9, & \text{for } -3 \leq x < 0, \\ 2-x^2, & \text{for } 0 \leq x < 5, \\ \sqrt{x+5}, & \text{for } 5 \leq x < 10. \end{cases}$$

(i) Evaluate $f(4) + f(8)$. [2 marks](ii) Sketch the graph of $f(x)$. [6 marks](iii) State the domain and range of $f(x)$. [2 marks](iv) Find $\left(\frac{f}{g}\right)(2)$, given that $g(x) = 4 - 2x^2$. [2 marks]

Continued....

Question 3 (25 marks)

- (a) Let:

$$f(x) = x^5 + x^3 - 2.$$

- (i) Use synthetic division to find the remainder and quotient of $\frac{f(x)}{x-2}$. [5 marks]
- (ii) Determine whether $x-1$ is a factor of $f(x)$ by using the factor theorem. [3 marks]

- (b) Use long division to find the quotient and remainder of

$$f(x) = \frac{x^4 + 2x^3 - 4x^2 - 5x - 6}{x^2 + x - 2}. \quad [5 \text{ marks}]$$

- (c) Given the rational function

$$f(x) = \frac{2(1+x^3)}{x^2(x^2+3x+2)},$$

use partial fraction decomposition to show that $f(x)$ can be written in the form

$$f(x) = \frac{1}{x^2} + \frac{7}{2(x+2)} - \frac{3}{2x}. \quad [12 \text{ marks}]$$

Question 4 (25 marks)

- (a) A theatre has twenty rows of seating. The first row has 26 seats, the second row 28 seats, the third 30 seats, and this pattern continues until the fifteenth row. The sixteenth row to the twentieth row each has 50 seats.
- (i) Find the number of seats in the tenth row. [2 marks]
- (ii) Find the total number of seats in the theatre. [4 marks]

- (b) Find the sum of the following series:

(i) $\frac{1}{2} + 1 + 2 + \dots + 128$ [7 marks]

(ii) $\frac{22}{9} + \frac{11}{6} + \frac{11}{8} + \dots$ [3 marks]

- (c) Use the Binomial Theorem to find the coefficient of a^7 in the expansion of $(2a+3)^9$. Then, write the first FIVE terms of the binomial expansion in descending powers of a . [9 marks]

End of Paper